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(54)【発明の名称】　透明導電基板とそれを用いた有機エレクトロルミネッセンス素子

(57)【要約】
【課題】　後付けフィルターを使用せずに、有機エレクトロルミネッセンス素子などの素子にフィルターの機能を付与することが可能な、新規な透明導電基板と、それを用いた有機エレクトロルミネッセンス素子とを提供する。
【解決手段】　透明導電基板は、透明基板上に、着色物質によって着色された、フィルターとしての機能を備えた透明導電膜を形成した。有機エレクトロルミネッセンス素子は、有機の層を挟む陰極および陽極のうちの一方を、フィルターとしても機能させるべく、上記透明導電基板の、着色された透明導電膜にて形成した。

ものである。

【００１１】かかる本発明の透明導電基板は、上記のように透明導電膜がフィルターとしても機能するために、後付けフィルターを必要としない。

【００１２】このため、上記本発明の透明導電基板を用いて形成した、たとえば有機エレクトロルミネッセンス素子などの素子は、フィルターとしての機能を有しているにもかかわらず、従来の、フィルターを後付けする前の素子と同じ構成になって、その構造が複雑化することが防止される。

【００１３】また上記透明導電膜は、その形成材料としての透明導電材料に着色物質を添加すること以外は従来と同様にして形成されるため、製造プロセスにおいて工程が増加することもない。

【００１４】したがって本発明によれば、素子の生産性を低下させたり、あるいは生産のコストを大幅に上昇させたりすることなしに、素子にフィルターの機能を付与することが可能となる。

【００１５】また素子は、後付けフィルターを組み込むための余計なスペースを必要としないので、スペースを確保するために透明基板などの厚みを薄くする必要がなく、素子の強度や耐久性などが低下するおそれもない。

【００１６】さらに、透明基板として柔軟なプラスチックフィルムなどを使用して素子に可とう性を付与した場合に、素子の可とう性が阻害されたり、あるいは素子をたわませた際にはく離が発生したりするといった問題を生じるおそれもない。

【００１７】また本発明の有機エレクトロルミネッセンス素子は、陰極および陽極と、この両極間に挟まれた単層または複層の有機の層とを備えたものであって、上記陰極および陽極のうちの一方が、フィルターとしても機能させるべく、上記本発明の透明導電基板の、着色された透明導電膜にて形成されたことを特徴とするものであり、後付けフィルターを必要としないために、以上で述べたような種々の利点を有するものとなる。

【００１８】

【発明の実施の形態】以下に、本発明を説明する。

〈透明導電基板〉本発明の透明導電基板は、前記のように透明基板上に、着色物質によって着色された、フィルターとしての機能を備えた透明導電膜を有することを特徴とするものである。

【００１９】かかる透明導電基板を形成する透明基板としては、たとえばガラス板、透明プラスチック板、透明プラスチックシート、透明プラスチックフィルムなどの、透明基板として従来公知の種々の基板が、いずれも使用可能である。その寸法、形状などは目的とする素子の構造などに応じて適宜、設定することができる。

【００２０】ちなみにこの透明基板を着色物質によって着色することで、透明導電膜でなく透明基板の方にフィルターとしての機能を持たせることも検討したが、その場合には、たとえば波長特性や濃度などの、フィルターとしての仕様の変更が容易でない上、上記波長特性や濃度などの微妙なずれに対する微調整も容易でないという問題があった。

【００２１】これに対し、透明導電膜にフィルターとしての機能を持たせる本発明の構成によれば、当該透明導電膜の形成段階で、後述するように透明導電材料に添加する着色物質の種類や量、あるいは透明導電膜の膜厚などを調整することで、波長特性や濃度などを容易かつ精密にできるので、フィルターとしての仕様の変更に柔軟に対応できるとともに、波長特性や濃度の微調整が容易であるという利点がある。

【００２２】ただし本発明は、透明基板を着色することを全く排除するものではなく、透明基板と透明導電膜の両方を同一または異なる着色物質で着色して、この両方により、透明導電基板の全体に、フィルターとしての機能を持たせるようにしてもよい。

【００２３】このように構成すると、たとえば上記のようにフィルターとしての仕様の変更や微調整は容易でないが、逆に同じ仕様のものを安定して多量に生産するのに適するという透明基板の特徴と、波長特性や濃度の微調整が容易であるという透明導電膜の特徴とをともに生かして、フィルターとしての機能にすぐれた透明導電基板を、安定的に製造できるといった利点がある。

【００２４】上記透明基板上に形成される透明導電膜は、従来同様に透明導電材料にて形成される。透明導電材料としては、その名のとおり透明（少なくとも可視光を透過する）で、かつ有機エレクトロルミネッセンス素子などの素子の電極として機能するために必要、十分な導電性を有する種々の材料が、いずれも使用可能である。

【００２５】かかる透明導電材料の好適な例としては、たとえばインジウム、亜鉛、およびスズのうち少なくとも１種の金属の酸化物、具体的にはＩＴＯ（インジウムチンオキサイド）やＩＸＯ［$In_2O_3(ZnO)_n$六方晶層状化合物］などがあげられる。

【００２６】上記透明導電材料にて形成される透明導電膜を着色する着色物質としては、従来の、後付けフィルターで使用される無機または有機の種々の着色物質が、いずれも使用可能である。

【００２７】このうち無機の着色物質としては、たとえばカーボンやヨウ素などがあげられる他、鉄、コバルト、カドミウム、アルミニウムなどの元素を含む無機塩類（主に無機顔料として分類されるもの）なども使用可能である。

【００２８】また有機の着色物質としては、主に有機染料、有機顔料などに分類される種々の化合物が、いずれも使用可能である。

【００２９】その好適な例としては、たとえば式(1)：

【００３０】

みを２００～１００００Å程度、好ましくは５００～３０００Å程度とすることで、当該透明導電膜の、波長５００ｎｍの光の透過率が上記の範囲内に調整される。

【００４６】上記透明導電膜を透明基板上に形成する方法としては、たとえば真空蒸着法、電子ビーム蒸着法、スパッタリング法、レーザーアブレーション法、イオンプレーティング法などの気相成長法が好適に採用される。

【００４７】具体的にはたとえば、透明導電材料と着色材料とを、蒸気圧の相違による蒸着速度の差などを利用して同じ蒸発源から、あるいは両材料の蒸着速度を個別に、独立して調整することを考慮して別々の蒸発源から、ほぼ同時に蒸発させて、透明基板上に、それぞれ所定の蒸着速度で蒸着させるいわゆる同時蒸着法により、透明導電材料にて形成され、着色材料が所定の比率で添加された、着色された透明導電膜が形成される。

【００４８】またこの際、所定のパターンを有するマスクを用いて、透明基板の表面をマスキングしてやると、透明導電膜が、上記マスクのパターンに対応して、透明基板の表面にパターン形成される。

【００４９】かかるパターン形成された透明導電膜は、たとえば有機エレクトロルミネッセンス素子の発光領域に意味のある形状を付与したり、あるいはセグメント表示、ドットマトリクス表示をしたりするために好適に使用される。

【００５０】また透明導電膜はパターン形成せずに連続した平面状に形成し、その上に、当該透明導電膜の電極としての機能を妨げる層、たとえば透明導電膜を有機エレクトロルミネッセンス素子の陽極として使用する場合は、当該陽極から有機の層に正孔が注入されるのを防止する機能を有する、仕事関数４．８ｅＶ以下の材料からなる層をパターン形成しても、透明導電膜をパターン形成する場合と同様の効果が得られる。

【００５１】なお透明導電膜は、ゾルーゲル法などのウエットプロセスによって作製してもよく、その場合には、ウエットプロセスにて透明導電膜を形成するための溶液に、前記着色材料を添加してやればよい。

【００５２】上記本発明の透明導電基板は、前述した有機エレクトロルミネッセンス素子だけでなく、たとえば液晶表示素子などの、従来公知の種々の表示素子に好適に使用することができる。そしてこれら各種素子に、種々の問題を生じるおそれのある後付けフィルターを使用せずに、フィルターの機能を付与できるというすぐれた作用効果を奏することができる。

〈有機エレクトロルミネッセンス素子〉つぎに、本発明の有機エレクトロルミネッセンス素子について説明する。

【００５３】本発明の有機エレクトロルミネッセンス素子は、前述したように、陰極および陽極と、この両極間に挟まれた有機の層とを備えたものであって、上記陰極および陽極のうちの一方が、フィルターとしても機能させるべく、上記本発明の透明導電基板の、着色された透明導電膜にて形成されたことを特徴とするものである。

【００５４】上記のうち有機の層は単層または複層のいずれであってもよいが、先に述べた理由から複層であるのが好ましい。

【００５５】また、上記複層構造の有機の層の、層数や層構成などはとくに限定されないが、たとえば陽極側から陰極側へ順に、下記の各層の中から２層以上を適宜、選択して組み合わせるのが好ましい。

(a) 陽極からホール輸送層にホールが注入されるのを助ける〈ホール注入層〉。

(b) 陽極から注入されたホールを陰極側へ輸送する〈ホール輸送層〉。

(c) 陰極から注入された電子を陽極側へ輸送する〈電子輸送層〉。

(d) 陰極から電子輸送層に電子が注入されるのを助ける〈電子注入層〉。

【００５６】かかる各層はそれぞれ、特定の機能を有する有機化合物のみで形成してもよいし、上記有機化合物を、たとえばバインダーとしての、それ自体がキャリヤ輸送性を有するまたは有しない高分子中に分散させて形成してもよい。また、たとえばポリフェニレンビニレン誘導体などの、高分子で、しかも特定の機能を有する化合物単独で層を形成してもよい。

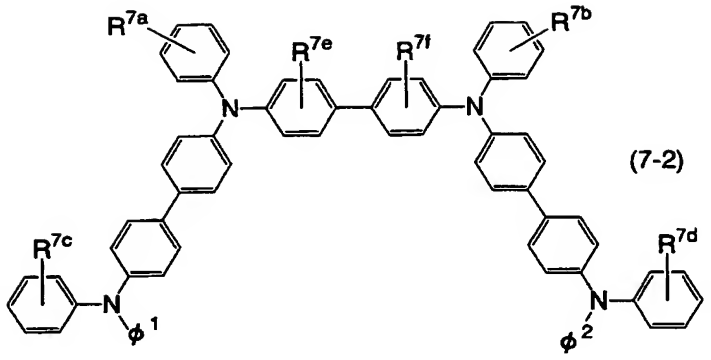
【００５７】上記各層を備えた複層構造の有機の層の具体例としては、これに限定されないがたとえば(A) ホール輸送層と電子輸送層の２層を備え、このうちのいずれか一方または両方が発光するもの、(B) ホール注入層とホール輸送層と電子輸送層の３層を備え、このうちホール輸送層および／または電子輸送層が発光するもの、(C) ホール輸送層と電子輸送層と電子注入層の３層を備え、このうちホール輸送層および／または電子輸送層が発光するもの、(D) ホール注入層とホール輸送層と電子輸送層と電子注入層の４層を備え、このうちホール輸送層および／または電子輸送層が発光するもの、などがあげられる。

【００５８】上記各層構成の素子において、ホール輸送層および／または電子輸送層のいずれが発光するかは、両層に含まれる有機化合物の機能（たとえばホール輸送材料であればホール輸送性、電子輸送材料であれば電子輸送性など）の強弱とその組み合わせ、およびそれぞれの層の厚みなどを調整することによって適宜、変更することができる。

【００５９】また上記各層のうち発光する層には、その発光波長を調整するために、１種または２種以上の蛍光色素を含有させてもよい。

【００６０】前記各層のうちホール注入層を構成する、ホールの注入性にすぐれた有機化合物としては、たとえば前記式(2-1)で表される銅フタロシアニンや、あるい

11　　12



(7-2)

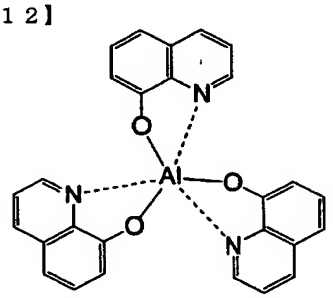
【００７１】〔式中、R^{7a}、R^{7b}、R^{7c}、R^{7d}、R^{7e}、およびR^{7f}は同一または異なって水素原子、アルキル基、ハロゲン化アルキル基、アリール基、ジアルキルアミノ基、またはシアノ基を示し、ϕ^1およびϕ^2は同一または異なって、置換基を有してもよい芳香族縮合環を示す。〕で表されるトリフェニルアミンの四量体などがあげられる。

【００７２】このうち一般式(7-2)の四量体の好適な例としては、たとえばN，N′－ジフェニルーN，N′－ビス〔Nーフェニルー Nー（２－ナフチル）－４′－アミノビフェニルー４－イル〕－１，１′－ビフェニルー４，４′－ジアミン、N，N′－ビス〔４－（tertーブチル）フェニル〕－N，N′－ビス〔N－４－（tertーブチル）フェニルーNー（２－ナフチル）－４′－アミノビフェニルー４－イル〕－１，１′-ビフェニルー４，４′－ジアミン、N，N′－ジフェニルーN，N′－ビス〔Nーフェニルー Nー（２－ナフチル）－４′－アミノビフェニルー４－イル〕－１，１′－ビフェニルー３，３′－ジメチルー４，４′－ジアミンなどがあげられる。

【００７３】電子輸送層を構成する電子輸送材料としては、たとえば式(8)：

【００７４】

【化１２】

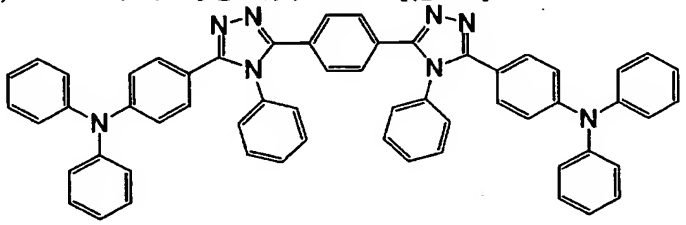


(8)

【００７５】で表されるトリス（８－キノリノラート）アルミニウム(III)錯体や、あるいは米国特許第５７９２５６７号公報に開示された、式(9-1)：

【００７６】

【化１３】



(9-1)

【００７７】で表される１，２，４－トリアゾール誘導体などがあげられる。

【００７８】また電子注入層は、電子輸送材料の中でも電子の注入性にすぐれた材料にて構成される。かかる電子注入性にすぐれた電子輸送材料としては、たとえば上記トリス（８－キノリノラート）アルミニウム(III)錯体の他、これも米国特許第５７９２５６７号公報に開示された、式(9-2)：

【００７９】

【化１４】

とし、陰極は、マグネシウム／銀、アルミニウム／リチウムなどの、アルカリ金属、アルカリ土類金属を含む合金にて形成するか、あるいはフッ化リチウム、酸化リチウムなどのリチウム化合物の層（無機の電子注入層）とアルミニウム層などの金属層（陰極本体）との積層構造とするとともに、製造工程上、陽極を透明基板の直上に、陰極を、当該陽極上に積層された有機の層の最上層に、それぞれ配置して、陽極と透明基板とを通して光を素子外に取り出すように構成するのが好適であり、本発明においても、かかる構成を採用するのが好ましい。

【００９６】すなわち陽極を、本発明の透明導電基板の、着色された透明導電膜にて形成するとともに、当該透明導電基板の透明基板を、素子の全体を支え、かつ、有機の層からの光を素子外に取り出す透明基板として使用するのが好ましい。

【００９７】また陰極を、たとえば上記マグネシウム／銀、アルミニウム／リチウムなどの合金製の、厚み１０００Å以下、より好ましくは５００Å以下の層（電子注入電極）と、その上に積層された、ＩＴＯやＩＸＯなどの透明導電材料の層の２層構造などとすると、当該陰極も透明となるため、上記の各層を保護する保護層、各層を封止する封止材などとして透明な材質のものを使用することにより、素子の非発光時にその全体が透明な有機エレクトロルミネッセンス素子がえられる。

【００９８】また透明基材として、先に述べたように可とう性のある透明プラスチックフィルムなどを使用すると、可とう性のある素子がえられる。

【００９９】さらにまた透明基材として、感光性のプラスチックからなる板やフィルムなどを使用すれば、かかる透明基材を、素子が劣化しないレベルの光で露光してパターン形成することにより、所定の平面形状を有する素子を製造することもできる。

【０１００】素子は、たとえば発光時に大気に触れて、層を構成する有機化合物が酸化劣化するなどして、発光輝度が著しく低下したり、あるいは発光が停止してしまったりするのを防止すべく、各層を形成後に、その一部または全体を、封止材によって封止してもよい。封止材としては、たとえばエポキシ樹脂系、ポリエステル樹脂系、シリコーン樹脂系などの種々の硬化性の樹脂があげられる。素子を封止材によって封止するには、たとえばポッティング、ディッピングなどの公知の方法が採用される。

【０１０１】上記の各部からなる本発明の有機エレクトロルミネッセンス素子は、たとえば液晶表示素子のバックライトや、あるいは照明装置などに使用される面状発光体の他、発光層や陰陽両極などを所定のパターンに形成することで、セグメント表示素子、ドットマトリクス表示素子などとして使用することもできる。

【０１０２】

【実施例】以下に本発明を、実施例、比較例に基づいて説明する。

〈透明導電基板〉

実施例１

界面活性剤、および有機溶媒を用いて順次、超音波洗浄したガラス基板を、透明導電材料としてのＩＴＯの蒸発源である電子ビーム蒸発源（２ｋＷ）と、着色物質としての銅フタロシアニンの蒸発源である、石英セルを用いた抵抗加熱式蒸発源とを備えた真空蒸着装置内に、所定のパターンを有するマスクとともにセットし、真空度５×１０$^{-6}$ torrまで装置内を減圧、排気した。

【０１０３】そして、ガラス基板を２００℃に加熱しつつ、上記両蒸発源からＩＴＯと銅フタロシアニンとを蒸発させて、ガラス基板上に、上記マスクのパターンに対応した透明導電膜を同時蒸着によりパターン形成して、透明導電基板を製造した。

【０１０４】このとき、ＩＴＯの蒸着速度は１２Å／秒、銅フタロシアニンの蒸着速度は３Å／秒、蒸着時間は２分間とした。

【０１０５】得られた透明導電膜は青色を呈し、その膜厚は１８００Å、銅フタロシアニンの含有割合は２０体積％、波長５５０ｎｍの光の透過率は６４．８％、抵抗率は５．２×１０$^{-4}$ Ω・ｃｍであった。

【０１０６】実施例２

着色物質としての銅フタロシアニンの蒸着速度を５Å／秒としたこと以外は実施例１と同様にして、ガラス基板上に透明導電膜をパターン形成して、透明導電基板を製造した。

【０１０７】得られた透明導電膜は実施例１よりも濃い青色を呈し、その膜厚は２０４０Å、銅フタロシアニンの含有割合は２９．４体積％、波長５５０ｎｍの光の透過率は５５．４％、抵抗率は８．２×１０$^{-4}$ Ω・ｃｍであった。

【０１０８】実施例３

着色物質として、銅フタロシアニンに代えて２，３－キナクリドンを使用したこと以外は実施例１と同様にして、ガラス基板上に透明導電膜をパターン形成して、透明導電基板を製造した。

【０１０９】得られた透明導電膜は緑色を呈し、その膜厚は１８００Å、２，３－キナクリドンの含有割合は２０体積％、波長５５０ｎｍの光の透過率は６７．２％、抵抗率は６．５×１０$^{-4}$ Ω・ｃｍであった。

〈有機エレクトロルミネッセンス素子〉

実施例４

上記実施例１で製造した透明導電基板を、まず界面活性剤、および有機溶媒を用いて順次、超音波洗浄したのち、真空蒸着装置内にセットし、真空度１０$^{-6}$～１０$^{-7}$ torrの条件下、当該透明導電基板の、フィルターを兼ねる着色された透明導電膜の上に、下記の各層を、それぞれ真空蒸着法によって連続的に、この順に積層、形成した。

PATENT ABSTRACTS OF JAPAN

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(54) TRANSPARENT CONDUCTIVE SUBSTRATE AND ORGANIC ELECTROLUMINESCENT ELEMENT USING THE SAME

(57)Abstract:
PROBLEM TO BE SOLVED: To give a filter function to an organic electroluminescent element without using an after-fitting filter by forming a transparent conductive film colored with the coloring material and having a filter function on a transparent substrate.
SOLUTION: A transparent conductive film on a transparent substrate is formed by using a normal transparent conductive material. As a desirable transparent conductive material, oxide of one or more kinds among In, Zn and Sn is used. As a material for coloring the transparent conductive film, a normal inorganic or organic material can be used, and quantity of addition thereof is appropriately set in response to the wavelength characteristic as a filter of the transparent conductive film and concentration thereof. In order to make the transparent conductive film effectively function as a filter, transmittance of the light having wavelength at 500 nm is desirably set at 70% or less. In the case of forming the transparent conductive film on the substrate, vapor phase epitaxy is desirable, and a mask having the predetermined pattern is used so as to form the pattern of the transparent conductive film.

LEGAL STATUS

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[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The transparence electric conduction substrate characterized by having the transparence electric conduction film equipped with the function as a filter colored with the coloring matter on the transparence substrate.
[Claim 2] The transparence electric conduction substrate according to claim 1 whose permeability of the light with a wavelength of 500nm in the colored transparence electric conduction film is 70% or less.
[Claim 3] The transparence electric conduction substrate according to claim 1 in which the transparence electric conduction film is formed with an indium, zinc, and the transparence electrical conducting material with which the oxide of at least one sort of metals is included among tin.
[Claim 4] The transparence electric conduction substrate according to claim 1 with which pattern formation of the transparence electric conduction film is carried out on the transparence substrate by the vapor growth using the mask which has a predetermined pattern.
[Claim 5] The organic electroluminescent element characterized by being formed by the transparence electric conduction film by which the transparence electric conduction substrate according to claim 1 was colored so that it might be the organic electroluminescent element equipped with cathode and the anode plate, and the organic layer of the monolayer pinched among these two poles, or a double layer and either the above-mentioned cathode or the anode plates might make it function also as a filter.

[Translation done.]

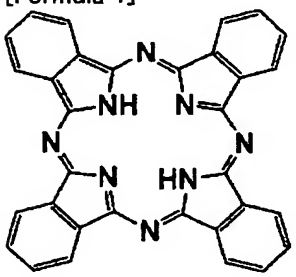
DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the transparence electric conduction substrate used suitable for components, such as for example, an organic electroluminescent element, and the organic electroluminescent element using it.
[0002]
[Description of the Prior Art] Since light is emitted in the shape of a field, in the field of the electroluminescent element of the thin film mold with which the utilization to various displays etc. is expected, the organic electroluminescent element whose organic layer of the monolayer which makes an organic compound a subject inter-electrode [of a shade Yoichi pair], or a double layer was pinched is becoming in use [the research and development] recently.
[0003] The organic electroluminescent element equipped with the organic layer of a double layer system which made the layer more than two-layer share each function, such as transport of a carrier (a hole, electron) and luminescence, also especially in it ** Compared with the conventional component which makes an inorganic material a subject, luminescence of high brightness is possible by the low battery, ** Since the formation approach which could adopt not only vacuum deposition but the solution applying method etc., and was suitable for the configuration in each layer as the formation approach of each class can be chosen and formed Since it has the advantage that multiple-color-izing and luminescence of a color which was not obtained until now are possible, by the molecular design of that the degree of freedom of a design of a component improves, and large area-ization of a component becomes easy, and a ** organic molecule, [, for example, C.W.Tang and S.A.VanSlyke;Appl.Phys.Lett.51,913, to which research and development are performed briskly in recent years (1987), C. — Adachi and T.Tsutsui and S.Saito; Appl.Phys.Lett. — 55 and 1489 (1989) — J. Kido, M.Kimura, and KNagai;], such as Science, Vol.267, and 1332 (1995).
[0004]
[Problem(s) to be Solved by the Invention] The organic electroluminescent element equipped with the organic layer of the above-mentioned monolayer or a double layer is combining with a light filter, ND (neutral density) filter, etc., and make the emission spectrum into Sharp, or the color tone of luminescence is adjusted, or it can be improved in contrast.
[0005] As an approach of combining a component and a filter As indicated by JP,6-132081,A For example, a component, The lateral surface of the transparence electric conduction substrate [what formed the transparence electric conduction film used as the electrode (mainly anode plate) of a component in one side of a transparence substrate] as a drawing side of light, On the concrete target which post-installs a filter in the field of a side and an opposite hand in which the above-mentioned transparence electric conduction film was formed, namely, for example It is common that a laminating, pasting, etc. carry out the filter of the shape of tabular [which produced the thin film used as a filter by vacuum evaporationo solution spreading, etc., or was produced beforehand], and a film.
[0006] However, with the above-mentioned configuration, while the structure of a component is complicated, since many processes for post-installing filters, such as cutting of the filter of the shape of washing of the substrate lateral surface, film production of a thin film-like filter, tabular, and a film and pasting, in the manufacture process are added, the productivity of a component falls, and there is a problem that the cost for component manufacture goes up substantially.
[0007] Moreover, in order to prevent it, when the tooth space for incorporating a component is too many needed, and thickness of a transparence substrate etc. is made thin, there is [since the thickness of a component increases only the part which the thickness of a filter for post-installation joins] also a problem that reinforcement, endurance, etc. of a component fall.
[0008] Moreover, when external [of the external filters produced beforehand, such as the shape of the above-mentioned external filter, especially a film,] is carried out to the component which gave flexibility, for example using the plastic film flexible as a transparence substrate etc., there is a possibility of producing the problem of checking the flexibility as the whole component, or exfoliating when it sags a component in itself, even if the external filter concerned is excellent in flexibility.
[0009] The object of this invention is to offer the new transparence electric conduction substrate which can give the function of a filter to components, such as an organic electroluminescent element, and the organic electroluminescent element using it, without using a filter for post-installation with a possibility of producing the

above various problems.
[0010]
[The means for solving a technical problem and an effect of the invention] The transparence electric conduction substrate of this invention for solving the above-mentioned technical problem is characterized by having the transparence electric conduction film equipped with the function as a filter colored with the coloring matter on the transparence substrate.
[0011] The transparence electric conduction substrate of this this invention does not need a filter for post-installation, in order that the transparence electric conduction film may function also as a filter as mentioned above.
[0012] For this reason, it formed using the transparence electric conduction substrate of above-mentioned this invention, for example, it is prevented that components, such as an organic electroluminescent element, become the configuration same in spite of having the function as a filter as the component before post-installing the conventional filter, and that structure is complicated.
[0013] Moreover, other than adding the coloring matter to the transparence electrical conducting material as the formation ingredient, since the above-mentioned transparence electric conduction film is formed as usual, in a manufacture process, a process does not increase it.
[0014] Therefore, according to this invention, it becomes possible to give the function of a filter to a component, without reducing the productivity of a component or raising cost of production substantially.
[0015] Moreover, since a component does not need the excessive tooth space for incorporating a filter for post-installation, in order to secure a tooth space, it does not have to make thickness of a transparence substrate etc. thin, and does not have a possibility that reinforcement, endurance, etc. of a component may fall, either.
[0016] Furthermore, when flexibility is given to a component using a plastic film flexible as a transparence substrate etc., there is also no possibility of producing the problem that the flexibility of a component is checked, or breakaway occurs when sagging a component.
[0017] Moreover, the organic electroluminescent element of this invention It has cathode and an anode plate, and the organic layer of the monolayer pinched among these two poles, or a double layer. Since it is not characterized by being formed by the transparence electric conduction film by which the transparence electric conduction substrate of above-mentioned this invention was colored and does not need a filter for post-installation so that either the above-mentioned cathode or the anode plates may make it function also as a filter It has various advantages which were described above.
[0018]
[Embodiment of the Invention] Below, this invention is explained.
<Transparence electric conduction substrate> The transparence electric conduction substrate of this invention is characterized by having the transparence electric conduction film equipped with the function as a filter colored with the coloring matter on the transparence substrate as mentioned above.
[0019] As a transparence substrate which forms this transparence electric conduction substrate, each well-known various substrate is conventionally usable as transparence substrates, such as a glass plate, a transparence plastic sheet, a transparence plastic sheet, and a transparence plastic film, for example. The dimension, a configuration, etc. can be suitably set up according to the structure of the component made into the object etc.
[0020] Although it also considered giving the function as a filter to the direction of the transparence substrate instead of the transparence electric conduction film by incidentally coloring this transparence substrate with the coloring matter, there was a problem that the fine adjustment to a delicate gap of the above-mentioned wavelength property, concentration, etc. was not easy, either, in that case the top for which modification of the specification as filters, such as for example, a wavelength property and concentration, is not easy.
[0021] According to the configuration of this invention which gives the function as a filter to the transparence electric conduction film, on the other hand, in the formation phase of the transparence electric conduction film concerned By adjusting the class of coloring matter added to a transparence electrical conducting material so that it may mention later, the thickness of an amount or the transparence electric conduction film, etc. About a wavelength property, concentration, etc., since it is made to a precision, while being able to respond to modification of the specification as a filter flexibly, there are easy and an advantage that fine adjustment of a wavelength property or concentration is easy.
[0022] However, this invention does not eliminate coloring a transparence substrate at all, colors both a transparence substrate and the transparence electric conduction film by the same or different coloring matter, and you may make it give the function as a filter to the whole transparence electric conduction substrate by these both.

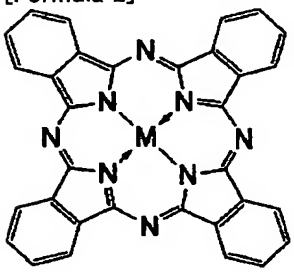
[0023] Thus, the description of the transparence substrate that it is suitable for it being stabilized and producing the thing of the same specification as reverse so much although modification or fine adjustment of the specification as a filter are not easy as mentioned above, for example if constituted, There is an advantage that the transparence electric conduction substrate excellent in the function as a filter can be stably manufactured taking advantage of both the descriptions of the transparence electric conduction film that fine adjustment of a wavelength property or concentration is easy.
[0024] The transparence electric conduction film formed on the above-mentioned transparence substrate is formed with a transparence electrical conducting material as usual. Each various ingredient which is transparence (the light is penetrated at least) as the name suggests, and has the need and sufficient conductivity as a transparence electrical conducting material in order to function as an electrode of components, such as an organic

electroluminescent element, is usable.
[0025] As a suitable example of this transparence electrical conducting material, ITO (indium tin oxide), IXO [an In2O3(ZnO) m hexagonal stratified compound], etc. are given to the oxide of at least one sort of metals, and a concrete target, for example among an indium, zinc, and tin.
[0026] As coloring matter which colors the transparence electric conduction film formed with the above-mentioned transparence electrical conducting material, each various coloring matter inorganic [which is used with the conventional filter for post-installation] or organic is usable.
[0027] Among these, as inorganic coloring matter, carbon, iodine, etc. are raised, for example, and also the mineral (what is mainly classified as an inorganic pigment) containing elements, such as iron, cobalt, cadmium, and aluminum, etc. is usable.
[0028] Moreover, as organic coloring matter, each various compound mainly classified into organic dye, an organic pigment, etc. is usable.
[0029] As the suitable example, it is formula (1): [0030], for example.
[Formula 1]



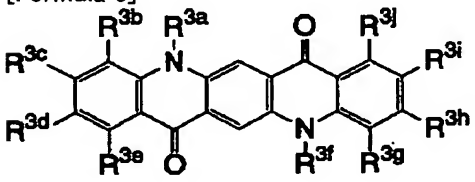
(1)

[0031] The non-metal phthalocyanine, general formula (2) which are come out of and expressed : [0032]
[Formula 2]



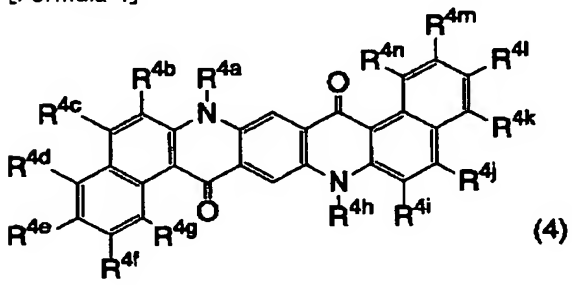
(2)

[0033] M shows a metal atom or a metallic oxide among [type.] The metal phthalocyanine, general formula (3) which are come out of and expressed : [0034]
[Formula 3]



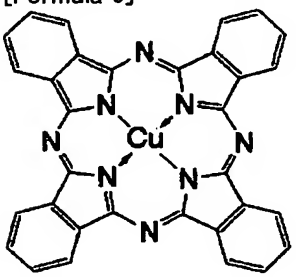
(3)

[0035] [— the inside of a formula, R3a, R3b, R3c, R3d, and R3 — e and R — 3f R 3g R 3h, R3i, and R3j are the same — or it differs and a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown.] The Quinacridone derivative come out of and expressed, and general formula (4) :
[0036]
[Formula 4]



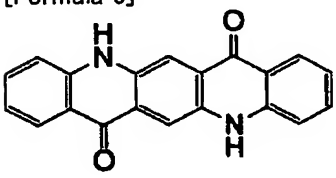
(4)

[0037] [— the inside of a formula, R4a, R4b, R4c, R4d, and R4 — e and R — 4f R 4g R 4h, R4i, R4j, and R4 — k, R4l., R4m, and R4n are the same — or it differs and a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown.] It comes out and the Quinacridone derivative expressed is raised.
[0038] As a suitable example of the metal phthalocyanine of a general formula (2), the copper phthalocyanine whose M is a copper atom as shown, for example in a formula (2-1) is raised among the above.
[0039]
[Formula 5]



(2-1)

[0040] Moreover, 2 and 3-Quinacridone each of whose R3 a-R3j is hydrogen atoms as a suitable example of the Quinacridone derivative expressed with a general formula (3) as shown, for example in a formula (3-1) is raised.
[0041]
[Formula 6]



(3-1)

[0042] The above-mentioned coloring matter is used independently, respectively, and also it can also use two or more sorts together in accordance with the wavelength property as a filter of the transparence electric conduction film etc.
[0043] moreover, the addition to the transparence electrical conducting material of the coloring matter — this — the wavelength property as a filter of the transparence electric conduction film — or in accordance with concentration etc., it can set up suitably.
[0044] However, in order to operate the transparence electric conduction film effectively as a filter, it is not desirable that the concentration is too low not much, for example, it is desirable that the permeability of light with a wavelength of 500nm has sufficient concentration of about 55 - 68% especially 70% or less.
[0045] What is necessary is to adjust the addition of the coloring matter as mentioned above, or just to adjust the thickness of the transparence electric conduction film, as stated previously in order to adjust the concentration of the transparence electric conduction film. Although not limited to this, in the content rate of the coloring matter to the whole quantity of the transparence electric conduction film, it is 1 - 80 volume % extent and making preferably about 200-10000A of thickness of 5 - 30 volume % extent and the transparence electric conduction film into about 500-3000A, and, specifically, the permeability of the light with a wavelength of 500nm of the transparence electric conduction film concerned is adjusted within the limits of the above.
[0046] As an approach of forming the above-mentioned transparence electric conduction film on a transparence substrate, vapor growth, such as vacuum evaporation technique, electron beam vacuum deposition, the sputtering method, the laser ablation method, and the ion plating method, is adopted suitably, for example.
[0047] The difference of the evaporation rate according a transparence electrical conducting material and the charge of a coloring matter to a difference of vapor pressure etc. is specifically used. From the same evaporation source With or the so-called simultaneous vacuum deposition which evaporates the evaporation rate of both ingredients almost simultaneous, and makes it vapor-deposit with a predetermined evaporation rate on a transparence substrate from a separate evaporation source in consideration of adjusting according to an individual independently, respectively It is formed with a transparence electrical conducting material, and the colored transparence electric conduction film with which the charge of a coloring matter was added by the predetermined ratio is formed.
[0048] Moreover, if the front face of a transparence substrate is masked using the mask which has a predetermined pattern in this case, corresponding to the pattern of the above-mentioned mask, pattern formation of the transparence electric conduction film will be carried out to the front face of a transparence substrate.
[0049] This transparence electric conduction film by which pattern formation was carried out is suitably used, in order to give the configuration the luminescence field of for example, an organic electroluminescent element has a meaning or to give a segment display and a dot-matrix indication.
[0050] The transparence electric conduction film is formed in the plane which continued without carrying out

pattern formation. Moreover, on it When using the layer which bars the function as an electrode of the transparence electric conduction film concerned, for example, the transparence electric conduction film, as an anode plate of an organic electroluminescent element Even if it carries out pattern formation of the layer which consists of an ingredient of 4.8eV or less of work functions which has the function to prevent that an electron hole is injected into an organic layer from the anode plate concerned, the same effectiveness as the case where pattern formation of the transparence electric conduction film is carried out is acquired.

[0051] In addition, the transparence electric conduction film may be produced according to wet process, such as a sol-gel method, and should just add said charge of a coloring matter in that case in the solution for forming the transparence electric conduction film in wet process.

[0052] The transparence electric conduction substrate of above-mentioned this invention can be used suitable for conventionally well-known various display devices, such as for example, not only the organic electroluminescent element mentioned above but a liquid crystal display component. And the outstanding operation effectiveness that the function of a filter can be given can be done so, without using the filter for post-installation which has a possibility of producing various problems in these various components.

<Organic electroluminescent element> Below, the organic electroluminescent element of this invention is explained.

[0053] The organic electroluminescent element of this invention is characterized by being formed by the transparence electric conduction film by which the transparence electric conduction substrate of above-mentioned this invention was colored so that it may be equipped with cathode and an anode plate, and the organic layer pinched among these two poles and either the above-mentioned cathode or the anode plates may operate it also as a filter, as mentioned above.

[0054] Although organic layers may be any of a monolayer or a double layer among the above, since it stated previously, it is desirable that it is a double layer.

[0055] Moreover, although especially an organic number of layers, lamination, etc. of a layer of the above-mentioned double layer system are not limited, it is desirable to choose suitably more than two-layer [out of following each class], and to combine it, for example from an anode plate side, in order, to a cathode side.

(a) Rescue that a hole is poured into a hole transporting bed from an anode plate <a hole impregnation layer>.

(b) Convey the hole poured in from the anode plate to a cathode side <a hole transporting bed>.

(c) Convey the electron poured in from cathode to an anode plate side <an electronic transporting bed>.

(d) Rescue that an electron is poured into an electronic transporting bed from cathode <an electronic injection layer>.

[0056] This each class may be formed only with the organic compound which has a specific function, respectively, may distribute the above-mentioned organic compound in the macromolecule which itself as a binder has carrier transportability, or does not have, and may be formed. Moreover, it is macromolecules, such as a polyphenylene vinylene derivative, for example, and a layer may be formed by the compound independent which moreover has a specific function.

[0057] As an example of the organic layer of the double layer system equipped with above-mentioned each class It is (A) although not limited to this. It has two-layer [of a hole transporting bed and an electronic transporting bed]. The thing and (B) to which either or both of these emit light It has three layers, a hole impregnation layer, a hole transporting bed, and an electronic transporting bed. Among these, the thing and (C) to which a hole transporting bed and/or an electronic transporting bed emit light It has three layers, a hole transporting bed, an electronic transporting bed, and an electronic injection layer. Among these, the thing and (D) to which a hole transporting bed and/or an electronic transporting bed emit light That to which is equipped with four layers, a hole impregnation layer, a hole transporting bed, an electronic transporting bed, and an electronic injection layer, among these a hole transporting bed and/or an electronic transporting bed emit light is raised.

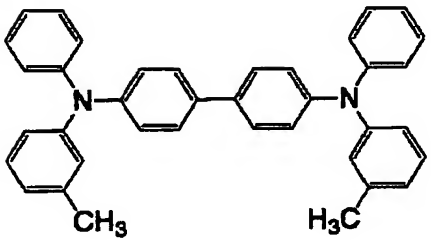
[0058] In the component of the above-mentioned class configuration, it can be changed [adjust / the thickness of each layer etc. / strength and / of the functions (for example, if it is a hole transport ingredient and is hole transportability and an electronic transport ingredient electronic transportability etc.) of the organic compound contained in both layers / combine and] suitably any shall emit light between a hole transporting bed and/or an electronic transporting bed.

[0059] Moreover, the layer which emits light among above-mentioned each class may be made to contain one sort or two sorts or more of fluorochromes in order to adjust the luminescence wavelength.

[0060] the copper phthalocyanine expressed with said formula (2-1), for example as an organic compound excellent in the impregnation nature of a hole which constitutes a hole impregnation layer among said each class — or the poly aniline, the poly thiophene, Pori (3 4)-ethylene dioxythiophene, carbon, etc. are raised. Moreover, in addition to a these hole injectional ingredient, the hole transport ingredient described below may be added in a hole impregnation layer.

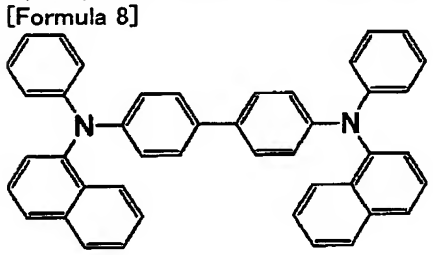
[0061] As a hole transport ingredient which constitutes a hole transporting bed, it is formula (5-1): [0062], for example.

[Formula 7]



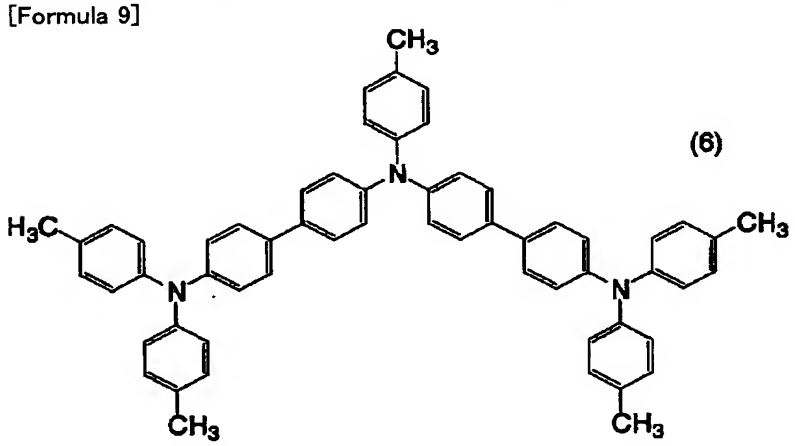
(5-1)

[0063] The N [which is come out of and expressed], N'-diphenyl-N, and N'-screw (3-methylphenyl) -1, 1'-biphenyl-4,4'-diamine, formula (5-2) : [0064]
[Formula 8]



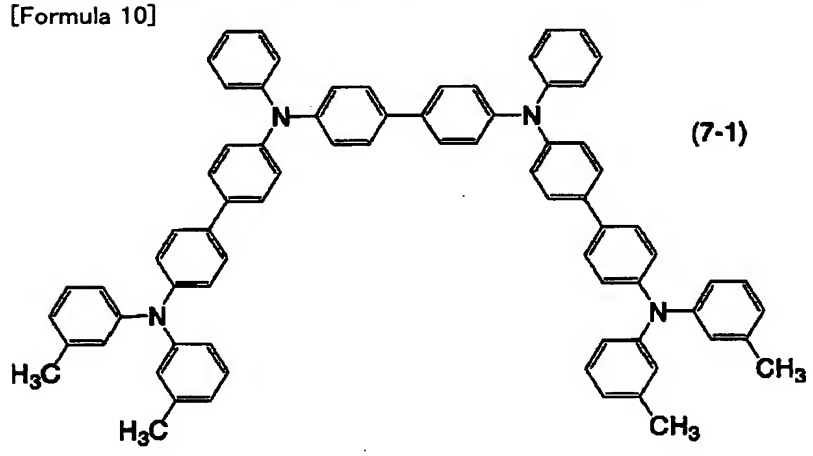
(5-2)

[0065] the compound which comes out and is guided from dimers of a triphenylamine, such as N [which is expressed], N'-diphenyl-N, and N'-JI (2-naphthyl) -1 and 1'-biphenyl-4,4'-diamine, and formula (6):[0066 —]
[Formula 9]



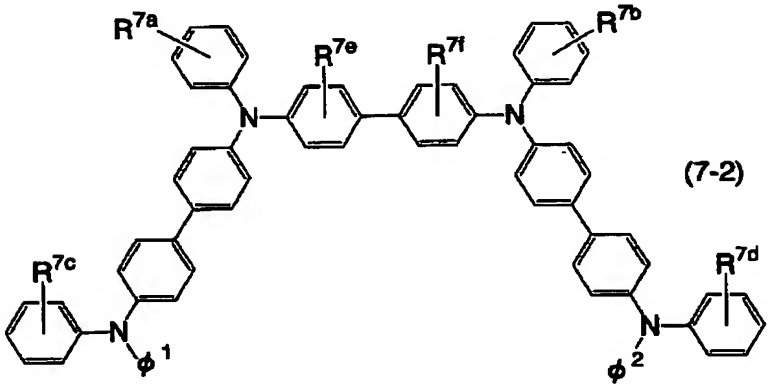
(6)

[0067] The trimer of the triphenylamine come out of and expressed, or formula (7-1) : [0068]
[Formula 10]



(7-1)

[0069] ******** (7-2) : [0070]
[Formula 11]

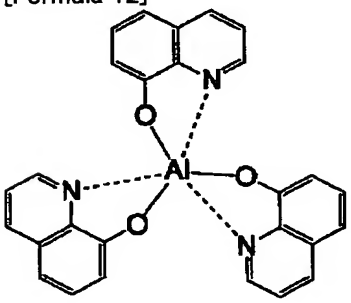


(7-2)

[0071] the inside of [type, and R7 — a, R7b, R7c, R7d, R7e, and R7f are the same — or it differs, a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown, and phi1 and phi2 show the same or the aromatic series condensed ring which may differ and may have a substituent.] It comes out and the tetramer of the triphenylamine expressed etc. is raised.

[0072] among these, as a suitable example of the tetramer of a general formula (7-2) For example, N, N'-diphenyl-N, N'-screw [N-phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl-4,4'-diamine, N, N'-screw [4-(tert-butyl) phenyl]-N, N'-screw [N-4-(tert-butyl) phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl-4,4'-diamine, The N, N'-diphenyl-N, N'-screw [N-phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl -3, the 3'-dimethyl -4, 4'-diamine, etc. are raised. [0073] As an electronic transport ingredient which constitutes an electronic transporting bed, it is formula (8): [0074], for example.

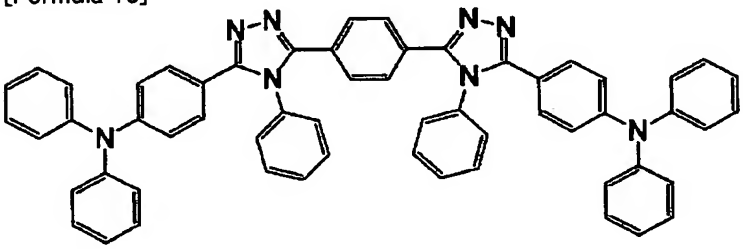
[Formula 12]



(8)

[0075] the tris (8-quinolate) aluminum (III) complex come out of and expressed — or formula (9-1): [0076] indicated by the U.S. Pat. No. 5792567 official report

[Formula 13]

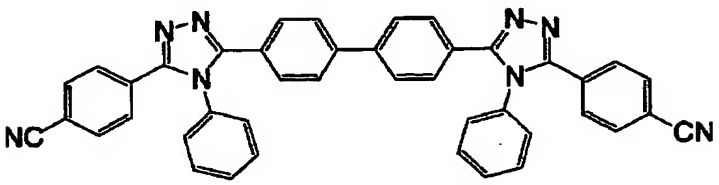


(9-1)

[0077] It comes out and 1 expressed, 2, and 4-triazole derivative etc. is raised.

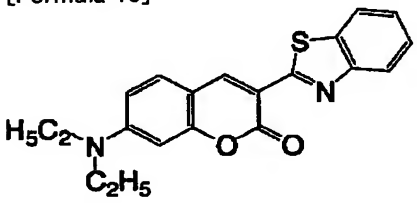
[0078] Moreover, an electronic injection layer is constituted by the ingredient excellent in electronic impregnation nature also in an electronic transport ingredient. As an electronic transport ingredient excellent in this electron injection nature, it is formula (9-2): [0079] by which this besides the above-mentioned tris (8-quinolate) aluminum (III) complex was also indicated by the U.S. Pat. No. 5792567 official report, for example.

[Formula 14]



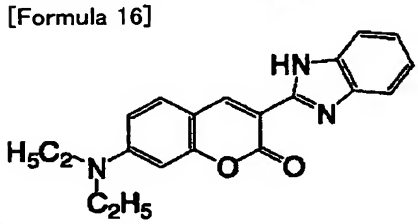
(9-2)

[0080] It comes out and 1, such as cyano group permutation triazole dimer expressed, 2, and 4-triazole derivative is raised.
[0081] Furthermore, in accordance with the luminescence wavelength made into the object, the various coloring matter which is excited by excitons, such as coloring matter for laser, for example, and can emit fluorescence as a fluorochrome which may be added in the layer which emits light among a hole transporting bed and/or an electronic transporting bed is one-sort independent, or is used two or more sorts.
[0082] As an example of a fluorochrome, cyanine dye, xanthene dye, an oxazine color, a coumarin derivative, the Quinacridone derivative, a naphthacene derivative, a perylene derivative, acridine dye, an acridone color, quinoline dye, etc. are raised, for example.
[0083] More specifically, it is formula (10): [0084].
[Formula 15]



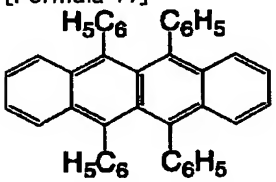
(10)

[0085] The coumarin 6 (green luminescence), formula (11) which are come out of and expressed : [0086]
[Formula 16]



(11)

[0087] The coumarin 7 come out of and expressed, said Quinacridone derivative (green luminescence) expressed with a general formula (3) and (4), formula (12) : [0088]
[Formula 17]

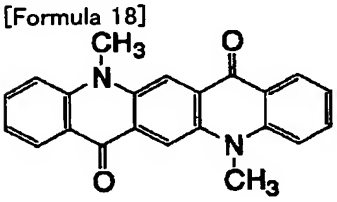


(12)

[0089] It comes out and the rubrene (5, 6, 11, a 12-tetra-phenyl naphthacene, yellow luminescence) expressed is suitably used as a fluorochrome.
[0090] Moreover, in addition to this, they are for example, a tetra-phenyl butadiene and 4-dicyanomethylene. - 2 - Dicyanomethylene styryl pyran system coloring matter, such as a methyl-6-p-dimethylaminostyryl-4H-pyran and a 4-dicyanomethylene-2-tert-butyl-6-(1, 1, 7, and 7-tetramethyl YUROJIRIRU-9-ENIRU)-4H-pyran, perylene, the Nile red, etc. can be used as a fluorochrome.
[0091] Although especially the thickness of said each class which constitutes the organic layer of a double layer system is not limited, as for especially each class, it is desirable respectively that it is about 100-800A about 50-1000A.
[0092] Moreover, although it changes with number of layerses to which the total thickness of the organic layer of the double layer system which carried out the laminating more than two-layer carried out the laminating of above-mentioned each class, it is especially desirable that it is about 1000-1500A about 800-2000A.
[0093] The above-mentioned organic layer can be formed by the various formation approaches, as mentioned above. namely, vapor growth, such as the so-called vacuum deposition method which make heat and sublimate in a vacuum the organic compound which constitutes a layer by approaches, such as resistance heating, and makes deposit on a substrate, — or it can form by the solution applying method for drying it, after applying on a substrate the coating

liquid which dissolved or distributed the organic compound which constitutes a layer in the suitable solvent with a spin coat method, a dip coating method, etc., and removing a solvent etc.
[0094] In order that the yin-and-yang two poles whose organic layers of these are pinched may take out luminescence from a luminous layer out of a component, at least one side needs to be transparent and the pole of while it is the transparence in the organic electroluminescent element of this invention is formed by the transparence electric conduction film by which the transparence electric conduction substrate of this invention was colored as mentioned above.
[0095] Generally, if an electron, the work function concerning the injection efficiency of a hole, etc. are taken into consideration, it will form with transparence electrical conducting materials, such as ITO which mentioned the anode plate above, and IXO, that is, will consider as transparence. Cathode Alkali metal, such as magnesium/silver, and aluminum/lithium, While forming with the alloy containing an alkaline earth metal or considering as the laminated structure of the layer (inorganic electronic injection layer) of lithium compounds, such as lithium fluoride and lithium oxide, and metal layers (cathode body), such as an aluminum layer It is suitable to arrange an anode plate on a production process, respectively in the maximum upper layer of the organic layer by which the laminating was carried out on the anode plate concerned in cathode right above [of a transparence substrate], and to constitute so that light may be taken out out of a component through an anode plate and a transparence substrate, and it is desirable also in this invention to adopt this configuration.
[0096] That is, while forming an anode plate by the transparence electric conduction film which the transparence electric conduction substrate of this invention was colored, it is desirable to use it as a transparence substrate which supports the transparence substrate of the transparence electric conduction substrate concerned for the whole component, and takes out the light from an organic layer out of a component.
[0097] More preferably cathode the thickness of 1000A or less made from alloys, such as for example, the above-mentioned magnesium/silver, and aluminum/lithium, moreover, a layer 500A or less (electronic notes telegram pole), If it is the two-layer structure of the layer of transparence electrical conducting materials, such as ITO and IXO, by which the laminating was carried out on it Since the cathode concerned also becomes transparent, an organic electroluminescent element with the transparent whole is obtained at the time of nonluminescent [of a component] by using the thing of construction material transparent as a sealing agent which closes the protective layer which protects above-mentioned each class, and each class.
[0098] Moreover, if a transparence plastic film with flexibility etc. is used as a transparence base material as stated previously, a component with flexibility will be obtained.
[0099] If a plate, a film, etc. which consist of photosensitive plastics as a transparence base material further again are used, the component which has a predetermined flat-surface configuration can also be manufactured by exposing and carrying out pattern formation of this transparence base material with the light of the level on which a component does not deteriorate.
[0100] A component may touch atmospheric air for example, at the time of luminescence, the organic compound which constitutes a layer may carry out oxidation degradation, and that it should prevent that luminescence brightness falls remarkably or luminescence stops, after forming each class, it may close the part or whole with a sealing agent. As a sealing agent, the resin of various hardenability, such as an epoxy resin system, a polyester resin system, and a silicone resin system, is raised, for example. In order to close a component with a sealing agent, well-known approaches, such as potting and dipping, are adopted.
[0101] the organic electroluminescent element of this invention which consists of above-mentioned each part — for example, the back light of a liquid crystal display component — or it is forming in a predetermined pattern others, a luminous layer, yin-and-yang two poles, etc., and can also be used as a segment display device, a dot-matrix display device, etc. [emitter / which is used for a lighting system etc. / field-like]
[0102]
[Example] This invention is explained based on an example and the example of a comparison below.
<Transparence electric conduction substrate> Using example 1 surfactant and the organic solvent, one by one, it set with the mask which has a predetermined pattern in the vacuum evaporator equipped with the electron beam evaporation source (2kW) which is an evaporation source of ITO as a transparence electrical conducting material about the glass substrate cleaned ultrasonically, and the resistance heating type evaporation source using a quartz cell which is an evaporation source of the copper phthalocyanine as coloring matter, and the inside of equipment was decompressed and exhausted to degree of vacuum 5x10-6torr.
[0103] And heating a glass substrate at 200 degrees C, ITO and a copper phthalocyanine were evaporated from both the above-mentioned evaporation sources, on the glass substrate, pattern formation of the transparence electric conduction film corresponding to the pattern of the above-mentioned mask was carried out by simultaneous vacuum evaporationo, and the transparence electric conduction substrate was manufactured.
[0104] At this time, the evaporation rate of ITO set 3A/[a second and] and vacuum evaporationo time amount as for 2 minutes for the evaporation rate of 12A /and a copper phthalocyanine a second.
[0105] The obtained transparence electric conduction film presented blue, and, for the thickness, 1800A and the content rate of a copper phthalocyanine was [the resistivity of the permeability of light with a 20 volume % and a wavelength of 550nm] 5.2x10-4ohm and cm 64.8%.
[0106] Except having carried out the evaporation rate of the copper phthalocyanine as quality of 2 suits of examples variety entertainments in 5A/second, like the example 1, pattern formation of the transparence electric conduction film was carried out on the glass substrate, and the transparence electric conduction substrate was manufactured.

[0107] The obtained transparence electric conduction film presented blue deeper than an example 1, and, for the thickness, 2040A and the content rate of a copper phthalocyanine was [the resistivity of the permeability of light with a 29.4 volume % and a wavelength of 550nm] 8.2x10-4 ohm-cm 55.4%.
[0108] Except having replaced with the copper phthalocyanine and having used 2 and 3-Quinacridone as quality of 3 suits of examples variety entertainments, like the example 1, pattern formation of the transparence electric conduction film was carried out on the glass substrate, and the transparence electric conduction substrate was manufactured.
[0109] The obtained transparence electric conduction film presented green, and, for the thickness, the content rate of 1800A, 2, and 3-Quinacridone was [the resistivity of the permeability of light with a 20 volume % and a wavelength of 550nm] 6.5x10-4 ohm-cm 67.2%.
<an organic electroluminescent element> — the transparence electric conduction film [which was colored] top which sets in a vacuum evaporator and serves as the filter of the transparence electric conduction substrate concerned under the condition of a degree of vacuum 10-6 - 10-7torr after cleaning ultrasonically first the transparence electric conduction substrate manufactured in the example 4 above-mentioned example 1 one by one using a surfactant and an organic solvent — following each class — respectively — a vacuum deposition method — continuous — this order — a laminating — it formed.
** The hole impregnation layer with a thickness of 400A which carried out vacuum deposition of the copper phthalocyanine, and formed it.
** The hole transporting bed with a thickness of 400A which carried out vacuum deposition of N, N'-diphenyl-N, and N'-JI (2-naphthyl) -1 and the 1'-biphenyl-4,4'-diamine, and formed them.
** Formula as a fluorochrome belonging to the Quinacridone derivative expressed with said general formula (3) (3-2) : [0110]
[Formula 18]



(3-2)

[0111] An electronic transporting bed-cum-the luminous layer with a thickness of 600A which was formed by coming out and carrying out the simultaneous vacuum evaporationo of N expressed, the N'-dimethyl -2, 3-Quinacridone, and the tris (8-quinolate) aluminum (III) complex and which contains Above N, the N'-dimethyl -2, and 3-Quinacridone at a rate of 0.4 volume %.
** The inorganic electronic injection layer with a thickness of 10A formed by carrying out vacuum deposition of the lithium fluoride (LiF).
** The cathode body with a thickness of 1000A formed by carrying out vacuum deposition of the aluminum.
[0112] Next, the transparence electric conduction substrate which the above-mentioned process ended was put in all over the glove compartment, and the glass plate for closure with which above-mentioned each class of the transparence electric conduction substrate concerned applied the epoxy resin of ultraviolet-rays hardenability to the laminating and the formed field with the desiccating agent (barium oxide) under desiccation nitrogen-gas-atmosphere mind was stuck, it closed by stiffening an epoxy resin according to UV irradiation and heat curing, and the organic electroluminescent element was manufactured.
[0113] When the contrast of a part for a light-emitting part and a nonluminescent part divided by carrying out pattern formation of the transparence electric conduction film as mentioned above was measured under conditions with an illuminance of 50 luxs, making the obtained organic electroluminescent element emit light with the brightness of 300 cd/cm2, the high value 80:1 was shown. Moreover, when luminescence was observed actually, the luminescence pattern for a light-emitting part was fully able to be checked also under the above-mentioned conditions.
[0114] As an example of comparison 1 transparence electric conduction substrate, the charge of a coloring matter was not contained but the organic electroluminescent element was manufactured like the example 4 except having used what has the transparence electric conduction film with a thickness of 1800A by which pattern formation was carried out only in ITO.
[0115] Making the obtained organic electroluminescent element emit light with the brightness of 300 cd/cm2, under conditions with an illuminance of 50 luxs, when the contrast of a part for a light-emitting part and a nonluminescent part was measured similarly, the low value 30:1 was shown. Moreover, when luminescence was observed actually, the luminescence pattern for a light-emitting part was not fully able to be checked.

[Translation done.]

* NOTICES *

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3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the transparence electric conduction substrate used suitable for components, such as for example, an organic electroluminescent element, and the organic electroluminescent element using it.

[Translation done.]

* NOTICES *

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PRIOR ART

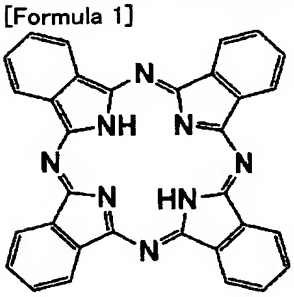
[Description of the Prior Art] Since light is emitted in the shape of a field, in the field of the electroluminescent element of the thin film mold with which the utilization to various displays etc. is expected, the organic electroluminescent element whose organic layer of the monolayer which makes an organic compound a subject inter-electrode [of a shade Yoichi pair], or a double layer was pinched is becoming in use [the research and development] recently.
[0003] The organic electroluminescent element equipped with the organic layer of a double layer system which made the layer more than two-layer share each function, such as transport of a carrier (a hole, electron) and luminescence, also especially in it ** Compared with the conventional component which makes an inorganic material a subject, luminescence of high brightness is possible by the low battery, ** Since the formation approach which could adopt not only vacuum deposition but the solution applying method etc., and was suitable for the configuration in each layer as the formation approach of each class can be chosen and formed Since it has the advantage that multiple-color-izing and luminescence of a color which was not obtained until now are possible, by the molecular design of that the degree of freedom of a design of a component improves, and large area-ization of a component becomes easy, and a ** organic molecule, [, for example, C.W.Tang and S.A.VanSlyke;Appl.Phys.Lett.51,913, to which research and development are performed briskly in recent years (1987), C. — Adachi and T.Tsutsui and S.Saito; Appl.Phys.Lett. — 55 and 1489 (1989) — J. Kido, M.Kimura, and KNagai;], such as Science, Vol.267, and 1332 (1995).

[Translation done.]

EFFECT OF THE INVENTION

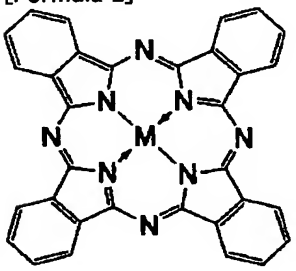
[The means for solving a technical problem and an effect of the invention] The transparence electric conduction substrate of this invention for solving the above-mentioned technical problem is characterized by having the transparence electric conduction film equipped with the function as a filter colored with the coloring matter on the transparence substrate.
[0011] The transparence electric conduction substrate of this this invention does not need a filter for post-installation, in order that the transparence electric conduction film may function also as a filter as mentioned above.
[0012] For this reason, it formed using the transparence electric conduction substrate of above-mentioned this invention, for example, it is prevented that components, such as an organic electroluminescent element, become the configuration same in spite of having the function as a filter as the component before post-installing the conventional filter, and that structure is complicated.
[0013] Moreover, other than adding the coloring matter to the transparence electrical conducting material as the formation ingredient, since the above-mentioned transparence electric conduction film is formed as usual, in a manufacture process, a process does not increase it.
[0014] Therefore, according to this invention, it becomes possible to give the function of a filter to a component, without reducing the productivity of a component or raising cost of production substantially.
[0015] Moreover, since a component does not need the excessive tooth space for incorporating a filter for post-installation, in order to secure a tooth space, it does not have to make thickness of a transparence substrate etc. thin, and does not have a possibility that reinforcement, endurance, etc. of a component may fall, either.
[0016] Furthermore, when flexibility is given to a component using a plastic film flexible as a transparence substrate etc., there is also no possibility of producing the problem that the flexibility of a component is checked, or breakaway occurs when sagging a component.
[0017] Moreover, the organic electroluminescent element of this invention It has cathode and an anode plate, and the organic layer of the monolayer pinched among these two poles, or a double layer. Since it is not characterized by being formed by the transparence electric conduction film by which the transparence electric conduction substrate of above-mentioned this invention was colored and does not need a filter for post-installation so that either the above-mentioned cathode or the anode plates may make it function also as a filter It has various advantages which were described above.
[0018]
[Embodiment of the Invention] Below, this invention is explained.
<Transparence electric conduction substrate> The transparence electric conduction substrate of this invention is characterized by having the transparence electric conduction film equipped with the function as a filter colored with the coloring matter on the transparence substrate as mentioned above.
[0019] As a transparence substrate which forms this transparence electric conduction substrate, each well-known various substrate is conventionally usable as transparence substrates, such as a glass plate, a transparence plastic sheet, a transparence plastic sheet, and a transparence plastic film, for example. The dimension, a configuration, etc. can be suitably set up according to the structure of the component made into the object etc.
[0020] Although it also considered giving the function as a filter to the direction of the transparence substrate instead of the transparence electric conduction film by incidentally coloring this transparence substrate with the coloring matter, there was a problem that the fine adjustment to a delicate gap of the above-mentioned wavelength property, concentration, etc. was not easy, either, in that case the top for which modification of the specification as filters, such as for example, a wavelength property and concentration, is not easy.
[0021] According to the configuration of this invention which gives the function as a filter to the transparence electric conduction film, on the other hand, in the formation phase of the transparence electric conduction film concerned By adjusting the class of coloring matter added to a transparence electrical conducting material so that it may mention later, the thickness of an amount or the transparence electric conduction film, etc. About a wavelength property, concentration, etc., since it is made to a precision, while being able to respond to modification of the specification as a filter flexibly, there are easy and an advantage that fine adjustment of a wavelength property or concentration is easy.
[0022] However, this invention does not eliminate coloring a transparence substrate at all, colors both a transparence substrate and the transparence electric conduction film by the same or different coloring matter, and you may make it give the function as a filter to the whole transparence electric conduction substrate by these both.

[0023] Thus, the description of the transparence substrate that it is suitable for it being stabilized and producing the thing of the same specification as reverse so much although modification or fine adjustment of the specification as a filter are not easy as mentioned above, for example if constituted, There is an advantage that the transparence electric conduction substrate excellent in the function as a filter can be stably manufactured taking advantage of both the descriptions of the transparence electric conduction film that fine adjustment of a wavelength property or concentration is easy.
[0024] The transparence electric conduction film formed on the above-mentioned transparence substrate is formed with a transparence electrical conducting material as usual. Each various ingredient which is transparence (the light is penetrated at least) as the name suggests, and has the need and sufficient conductivity as a transparence electrical conducting material in order to function as an electrode of components, such as an organic electroluminescent element, is usable.
[0025] As a suitable example of this transparence electrical conducting material, ITO (indium tin oxide), IXO [an $In_2O_3(ZnO)_m$ hexagonal stratified compound], etc. are given to the oxide of at least one sort of metals, and a concrete target, for example among an indium, zinc, and tin.
[0026] As coloring matter which colors the transparence electric conduction film formed with the above-mentioned transparence electrical conducting material, each various coloring matter inorganic [which is used with the conventional filter for post-installation] or organic is usable.
[0027] Among these, as inorganic coloring matter, carbon, iodine, etc. are raised, for example, and also the mineral (what is mainly classified as an inorganic pigment) containing elements, such as iron, cobalt, cadmium, and aluminum, etc. is usable.
[0028] Moreover, as organic coloring matter, each various compound mainly classified into organic dye, an organic pigment, etc. is usable.
[0029] As the suitable example, it is formula (1): [0030], for example.
[Formula 1]



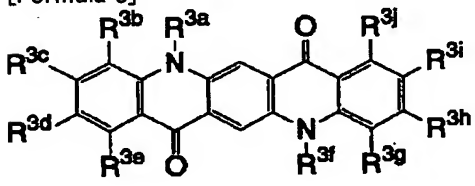
(1)

[0031] The non-metal phthalocyanine, general formula (2) which are come out of and expressed : [0032]
[Formula 2]



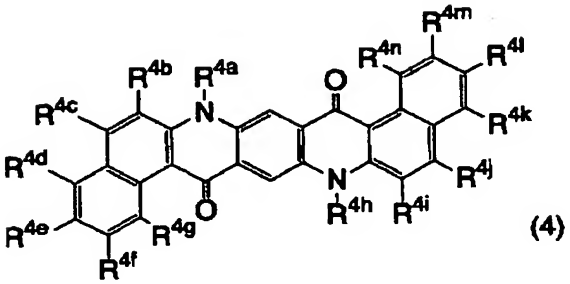
(2)

[0033] M shows a metal atom or a metallic oxide among [type.] The metal phthalocyanine, general formula (3) which are come out of and expressed : [0034]
[Formula 3]



(3)

[0035] [— the inside of a formula, R3a, R3b, R3c, R3d, and R3 — e and R — 3f R 3g R 3h, R3i, and R3j are the same — or it differs and a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown.] The Quinacridone derivative come out of and expressed, and general formula (4) :
[0036]
[Formula 4]



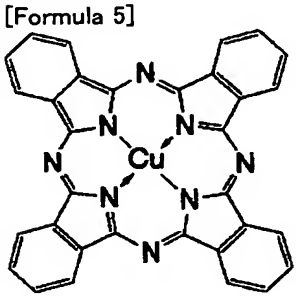
(4)

[0037] [— the inside of a formula, R4a, R4b, R4c, R4d, and R4 — e and R — 4f R 4g R 4h, R4i, R4j, and R4 — k, R4l., R4m, and R4n are the same — or it differs and a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown.] It comes out and the Quinacridone derivative expressed is raised.

[0038] As a suitable example of the metal phthalocyanine of a general formula (2), the copper phthalocyanine whose M is a copper atom as shown, for example in a formula (2-1) is raised among the above.

[0039]

[Formula 5]

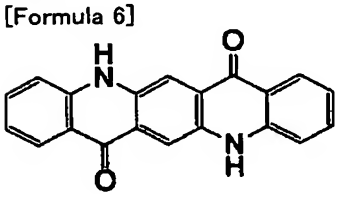


(2-1)

[0040] Moreover, 2 and 3-Quinacridone each of whose R3 a-R3j is hydrogen atoms as a suitable example of the Quinacridone derivative expressed with a general formula (3) as shown, for example in a formula (3-1) is raised.

[0041]

[Formula 6]



(3-1)

[0042] The above-mentioned coloring matter is used independently, respectively, and also it can also use two or more sorts together in accordance with the wavelength property as a filter of the transparence electric conduction film etc.

[0043] moreover, the addition to the transparence electrical conducting material of the coloring matter — this — the wavelength property as a filter of the transparence electric conduction film — or in accordance with concentration etc., it can set up suitably.

[0044] However, in order to operate the transparence electric conduction film effectively as a filter, it is not desirable that the concentration is too low not much, for example, it is desirable that the permeability of light with a wavelength of 500nm has sufficient concentration of about 55 - 68% especially 70% or less.

[0045] What is necessary is to adjust the addition of the coloring matter as mentioned above, or just to adjust the thickness of the transparence electric conduction film, as stated previously in order to adjust the concentration of the transparence electric conduction film. Although not limited to this, in the content rate of the coloring matter to the whole quantity of the transparence electric conduction film, it is 1 - 80 volume % extent and making preferably about 200-10000A of thickness of 5 - 30 volume % extent and the transparence electric conduction film into about 500-3000A, and, specifically, the permeability of the light with a wavelength of 500nm of the transparence electric conduction film concerned is adjusted within the limits of the above.

[0046] As an approach of forming the above-mentioned transparence electric conduction film on a transparence substrate, vapor growth, such as vacuum evaporation technique, electron beam vacuum deposition, the sputtering method, the laser ablation method, and the ion plating method, is adopted suitably, for example.

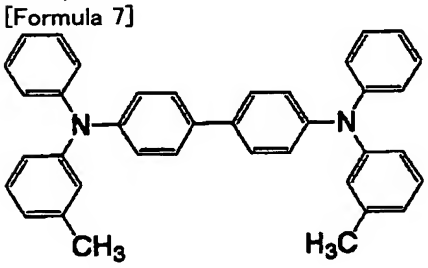
[0047] The difference of the evaporation rate according a transparence electrical conducting material and the charge of a coloring matter to a difference of vapor pressure etc. is specifically used. From the same evaporation source With or the so-called simultaneous vacuum deposition which evaporates the evaporation rate of both ingredients almost simultaneous, and makes it vapor-deposit with a predetermined evaporation rate on a

transparence substrate from a separate evaporation source in consideration of adjusting according to an individual independently, respectively It is formed with a transparence electrical conducting material, and the colored transparence electric conduction film with which the charge of a coloring matter was added by the predetermined ratio is formed.
[0048] Moreover, if the front face of a transparence substrate is masked using the mask which has a predetermined pattern in this case, corresponding to the pattern of the above-mentioned mask, pattern formation of the transparence electric conduction film will be carried out to the front face of a transparence substrate.
[0049] This transparence electric conduction film by which pattern formation was carried out is suitably used, in order to give the configuration the luminescence field of for example, an organic electroluminescent element has a meaning or to give a segment display and a dot-matrix indication.
[0050] The transparence electric conduction film is formed in the plane which continued without carrying out pattern formation. Moreover, on it When using the layer which bars the function as an electrode of the transparence electric conduction film concerned, for example, the transparence electric conduction film, as an anode plate of an organic electroluminescent element Even if it carries out pattern formation of the layer which consists of an ingredient of 4.8eV or less of work functions which has the function to prevent that an electron hole is injected into an organic layer from the anode plate concerned, the same effectiveness as the case where pattern formation of the transparence electric conduction film is carried out is acquired.
[0051] In addition, the transparence electric conduction film may be produced according to wet process, such as a sol-gel method, and should just add said charge of a coloring matter in that case in the solution for forming the transparence electric conduction film in wet process.
[0052] The transparence electric conduction substrate of above-mentioned this invention can be used suitable for conventionally well-known various display devices, such as for example, not only the organic electroluminescent element mentioned above but a liquid crystal display component. And the outstanding operation effectiveness that the function of a filter can be given can be done so, without using the filter for post-installation which has a possibility of producing various problems in these various components.
<Organic electroluminescent element> Below, the organic electroluminescent element of this invention is explained.
[0053] The organic electroluminescent element of this invention is characterized by being formed by the transparence electric conduction film by which the transparence electric conduction substrate of above-mentioned this invention was colored so that it may be equipped with cathode and an anode plate, and the organic layer pinched among these two poles and either the above-mentioned cathode or the anode plates may operate it also as a filter, as mentioned above.
[0054] Although organic layers may be any of a monolayer or a double layer among the above, since it stated previously, it is desirable that it is a double layer.
[0055] Moreover, although especially an organic number of layers, lamination, etc. of a layer of the above-mentioned double layer system are not limited, it is desirable to choose suitably more than two-layer [out of following each class], and to combine it, for example from an anode plate side, in order, to a cathode side.
(a) Rescue that a hole is poured into a hole transporting bed from an anode plate <a hole impregnation layer>.
(b) Convey the hole poured in from the anode plate to a cathode side <a hole transporting bed>.
(c) Convey the electron poured in from cathode to an anode plate side <an electronic transporting bed>.
(d) Rescue that an electron is poured into an electronic transporting bed from cathode <an electronic injection layer>.
[0056] This each class may be formed only with the organic compound which has a specific function, respectively, may distribute the above-mentioned organic compound in the macromolecule which itself as a binder has carrier transportability, or does not have, and may be formed. Moreover, it is macromolecules, such as a polyphenylene vinylene derivative, for example, and a layer may be formed by the compound independent which moreover has a specific function.
[0057] As an example of the organic layer of the double layer system equipped with above-mentioned each class It is (A) although not limited to this. It has two-layer [of a hole transporting bed and an electronic transporting bed]. The thing and (B) to which either or both of these emit light It has three layers, a hole impregnation layer, a hole transporting bed, and an electronic transporting bed. Among these, the thing and (C) to which a hole transporting bed and/or an electronic transporting bed emit light It has three layers, a hole transporting bed, an electronic transporting bed, and an electronic injection layer. Among these, the thing and (D) to which a hole transporting bed and/or an electronic transporting bed emit light That to which is equipped with four layers, a hole impregnation layer, a hole transporting bed, an electronic transporting bed, and an electronic injection layer, among these a hole transporting bed and/or an electronic transporting bed emit light is raised.
[0058] In the component of the above-mentioned class configuration, it can be changed [adjust / the thickness of each layer etc. / strength and / of the functions (for example, if it is a hole transport ingredient and is hole transportability and an electronic transport ingredient electronic transportability etc.) of the organic compound contained in both layers / combine and] suitably any shall emit light between a hole transporting bed and/or an electronic transporting bed.
[0059] Moreover, the layer which emits light among above-mentioned each class may be made to contain one sort or two sorts or more of fluorochromes in order to adjust the luminescence wavelength.
[0060] the copper phthalocyanine expressed with said formula (2-1), for example as an organic compound excellent in the impregnation nature of a hole which constitutes a hole impregnation layer among said each class — or the

poly aniline, the poly thiophene, Pori (3 4)-ethylene dioxythiophene, carbon, etc. are raised. Moreover, in addition to a these hole injectional ingredient, the hole transport ingredient described below may be added in a hole impregnation layer.

[0061] As a hole transport ingredient which constitutes a hole transporting bed, it is formula (5-1): [0062], for example.

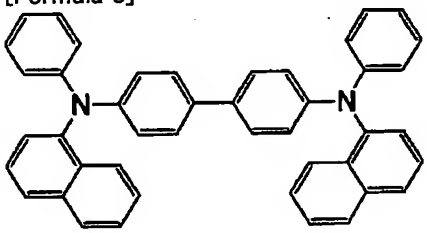
[Formula 7]



(5-1)

[0063] The N [which is come out of and expressed], N'-diphenyl-N, and N'-screw (3-methylphenyl) -1, 1'-biphenyl-4,4'-diamine, formula (5-2) : [0064]

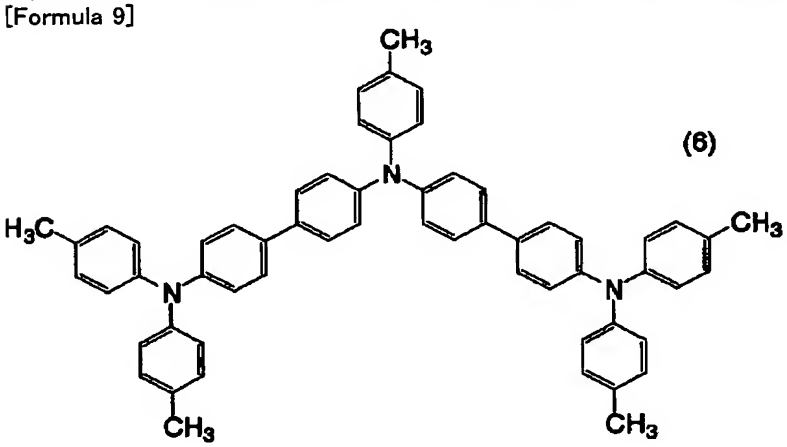
[Formula 8]



(5-2)

[0065] the compound which comes out and is guided from dimers of a triphenylamine, such as N [which is expressed], N'-diphenyl-N, and N'-JI (2-naphthyl) -1 and 1'-biphenyl-4,4'-diamine, and formula (6):[0066 —]

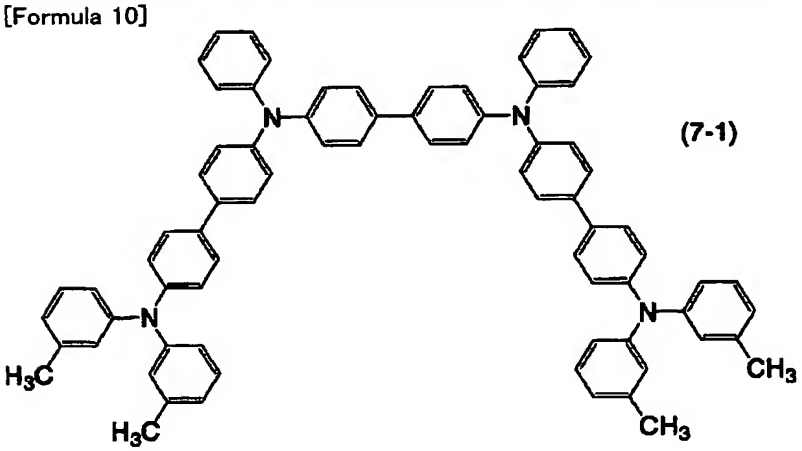
[Formula 9]



(6)

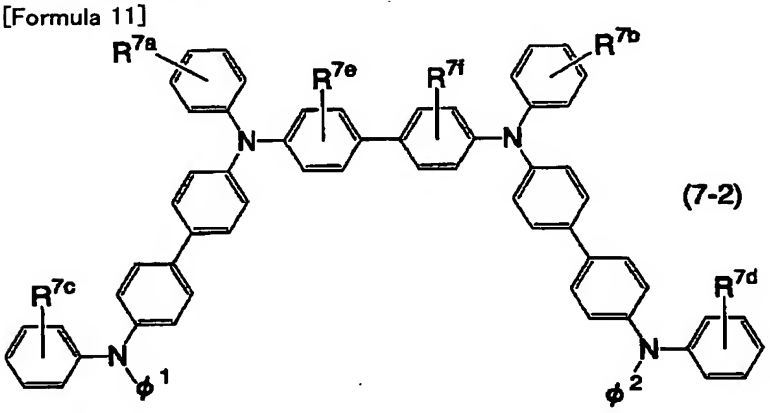
[0067] The trimer of the triphenylamine come out of and expressed, or formula (7-1) : [0068]

[Formula 10]



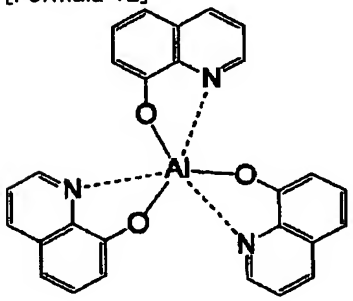
(7-1)

[0069] ******** (7-2) : [0070]
[Formula 11]



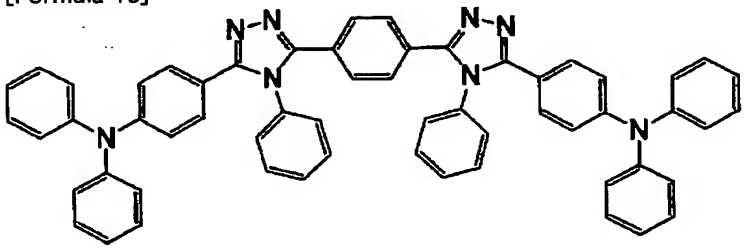
(7-2)

[0071] the inside of [type, and R7 — a, R7b, R7c, R7d, R7e, and R7f are the same — or it differs, a hydrogen atom, an alkyl group, an alkyl halide radical, an aryl group, a dialkylamino radical, or a cyano group is shown, and phi1 and phi2 show the same or the aromatic series condensed ring which may differ and may have a substituent.] It comes out and the tetramer of the triphenylamine expressed etc. is raised.
[0072] among these, as a suitable example of the tetramer of a general formula (7-2) For example, N, N'-diphenyl-N, N'-screw [N-phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl-4,4'-diamine, N, N'-screw [4-(tert-butyl) phenyl]-N, N'-screw [N-4-(tert-butyl) phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl-4,4'-diamine, The N, N'-diphenyl-N, N'-screw [N-phenyl-N-(2-naphthyl)-4'-amino biphenyl-4-IRU]-1, and 1'-biphenyl -3, the 3'-dimethyl -4, 4'-diamine, etc. are raised.
[0073] As an electronic transport ingredient which constitutes an electronic transporting bed, it is formula (8):
[0074], for example.
[Formula 12]



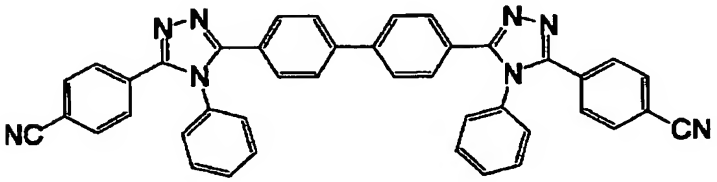
(8)

[0075] the tris (8-quinolate) aluminum (III) complex come out of and expressed — or formula (9-1): [0076] indicated by the U.S. Pat. No. 5792567 official report
[Formula 13]



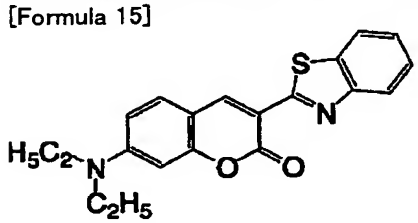
(9-1)

[0077] It comes out and 1 expressed, 2, and 4-triazole derivative etc. is raised.
[0078] Moreover, an electronic injection layer is constituted by the ingredient excellent in electronic impregnation nature also in an electronic transport ingredient. As an electronic transport ingredient excellent in this electron injection nature, it is formula (9-2): [0079] by which this besides the above-mentioned tris (8-quinolate) aluminum (III) complex was also indicated by the U.S. Pat. No. 5792567 official report, for example.
[Formula 14]



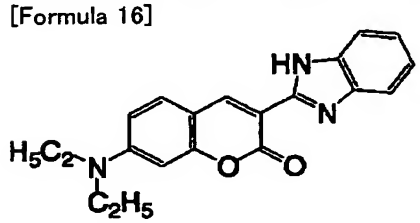
(9-2)

[0080] It comes out and 1, such as cyano group permutation triazole dimer expressed, 2, and 4-triazole derivative is raised.
[0081] Furthermore, in accordance with the luminescence wavelength made into the object, the various coloring matter which is excited by excitons, such as coloring matter for laser, for example, and can emit fluorescence as a fluorochrome which may be added in the layer which emits light among a hole transporting bed and/or an electronic transporting bed is one-sort independent, or is used two or more sorts.
[0082] As an example of a fluorochrome, cyanine dye, xanthene dye, an oxazine color, a coumarin derivative, the Quinacridone derivative, a naphthacene derivative, a perylene derivative, acridine dye, an acridone color, quinoline dye, etc. are raised, for example.
[0083] More specifically, it is formula (10): [0084].
[Formula 15]



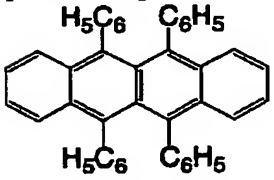
(10)

[0085] The coumarin 6 (green luminescence), formula (11) which are come out of and expressed : [0086]
[Formula 16]



(11)

[0087] The coumarin 7 come out of and expressed, said Quinacridone derivative (green luminescence) expressed with a general formula (3) and (4), formula (12) : [0088]
[Formula 17]



(12)

[0089] It comes out and the rubrene (5, 6, 11, a 12-tetra-phenyl naphthacene, yellow luminescence) expressed is suitably used as a fluorochrome.
[0090] Moreover, in addition to this, they are for example, a tetra-phenyl butadiene and 4-dicyanomethylene. - 2 - Dicyanomethylene styryl pyran system coloring matter, such as a methyl-6-p-dimethylaminostyryl-4H-pyran and a 4-dicyanomethylene-2-tert-butyl-6-(1, 1, 7, and 7-tetramethyl YUROJIRIRU-9-ENIRU)-4H-pyran, perylene, the Nile red, etc. can be used as a fluorochrome.
[0091] Although especially the thickness of said each class which constitutes the organic layer of a double layer system is not limited, as for especially each class, it is desirable respectively that it is about 100-800A about 50-1000A.
[0092] Moreover, although it changes with number of layerses to which the total thickness of the organic layer of the double layer system which carried out the laminating more than two-layer carried out the laminating of above-mentioned each class, it is especially desirable that it is about 1000-1500A about 800-2000A.
[0093] The above-mentioned organic layer can be formed by the various formation approaches, as mentioned above. namely, vapor growth, such as the so-called vacuum deposition method which make heat and sublimate in a vacuum the organic compound which constitutes a layer by approaches, such as resistance heating, and makes deposit on a substrate, — or it can form by the solution applying method for drying it, after applying on a substrate the coating

liquid which dissolved or distributed the organic compound which constitutes a layer in the suitable solvent with a spin coat method, a dip coating method, etc., and removing a solvent etc.
[0094] In order that the yin-and-yang two poles whose organic layers of these are pinched may take out luminescence from a luminous layer out of a component, at least one side needs to be transparent and the pole of while it is the transparence in the organic electroluminescent element of this invention is formed by the transparence electric conduction film by which the transparence electric conduction substrate of this invention was colored as mentioned above.
[0095] Generally, if an electron, the work function concerning the injection efficiency of a hole, etc. are taken into consideration, it will form with transparence electrical conducting materials, such as ITO which mentioned the anode plate above, and IXO, that is, will consider as transparence. Cathode Alkali metal, such as magnesium/silver, and aluminum/lithium, While forming with the alloy containing an alkaline earth metal or considering as the laminated structure of the layer (inorganic electronic injection layer) of lithium compounds, such as lithium fluoride and lithium oxide, and metal layers (cathode body), such as an aluminum layer It is suitable to arrange an anode plate on a production process, respectively in the maximum upper layer of the organic layer by which the laminating was carried out on the anode plate concerned in cathode right above [of a transparence substrate], and to constitute so that light may be taken out out of a component through an anode plate and a transparence substrate, and it is desirable also in this invention to adopt this configuration.
[0096] That is, while forming an anode plate by the transparence electric conduction film which the transparence electric conduction substrate of this invention was colored, it is desirable to use it as a transparence substrate which supports the transparence substrate of the transparence electric conduction substrate concerned for the whole component, and takes out the light from an organic layer out of a component.
[0097] More preferably cathode the thickness of 1000A or less made from alloys, such as for example, the above-mentioned magnesium/silver, and aluminum/lithium, moreover, a layer 500A or less (electronic notes telegram pole), If it is the two-layer structure of the layer of transparence electrical conducting materials, such as ITO and IXO, by which the laminating was carried out on it Since the cathode concerned also becomes transparent, an organic electroluminescent element with the transparent whole is obtained at the time of nonluminescent [of a component] by using the thing of construction material transparent as a sealing agent which closes the protective layer which protects above-mentioned each class, and each class.
[0098] Moreover, if a transparence plastic film with flexibility etc. is used as a transparence base material as stated previously, a component with flexibility will be obtained.
[0099] If a plate, a film, etc. which consist of photosensitive plastics as a transparence base material further again are used, the component which has a predetermined flat-surface configuration can also be manufactured by exposing and carrying out pattern formation of this transparence base material with the light of the level on which a component does not deteriorate.
[0100] A component may touch atmospheric air for example, at the time of luminescence, the organic compound which constitutes a layer may carry out oxidation degradation, and that it should prevent that luminescence brightness falls remarkably or luminescence stops, after forming each class, it may close the part or whole with a sealing agent. As a sealing agent, the resin of various hardenability, such as an epoxy resin system, a polyester resin system, and a silicone resin system, is raised, for example. In order to close a component with a sealing agent, well-known approaches, such as potting and dipping, are adopted.
[0101] the organic electroluminescent element of this invention which consists of above-mentioned each part — for example, the back light of a liquid crystal display component — or it is forming in a predetermined pattern others, a luminous layer, yin-and-yang two poles, etc., and can also be used as a segment display device, a dot-matrix display device, etc. [emitter / which is used for a lighting system etc. / field-like]

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The organic electroluminescent element equipped with the organic layer of the above-mentioned monolayer or a double layer is combining with a light filter, ND (neutral density) filter, etc., and make the emission spectrum into Sharp, or the color tone of luminescence is adjusted, or it can be improved in contrast.

[0005] As an approach of combining a component and a filter As indicated by JP,6-132081,A For example, a component, The lateral surface of the transparence electric conduction substrate [what formed the transparence electric conduction film used as the electrode (mainly anode plate) of a component in one side of a transparence substrate] as a drawing side of light, On the concrete target which post-installs a filter in the field of a side and an opposite hand in which the above-mentioned transparence electric conduction film was formed, namely, for example It is common that a laminating, pasting, etc. carry out the filter of the shape of tabular [which produced the thin film used as a filter by vacuum evaporationo solution spreading, etc., or was produced beforehand], and a film.

[0006] However, with the above-mentioned configuration, while the structure of a component is complicated, since many processes for post-installing filters, such as cutting of the filter of the shape of washing of the substrate lateral surface, film production of a thin film-like filter, tabular, and a film and pasting, in the manufacture process are added, the productivity of a component falls, and there is a problem that the cost for component manufacture goes up substantially.

[0007] Moreover, in order to prevent it, when the tooth space for incorporating a component is too many needed, and thickness of a transparence substrate etc. is made thin, there is [since the thickness of a component increases only the part which the thickness of a filter for post-installation joins] also a problem that reinforcement, endurance, etc. of a component fall.

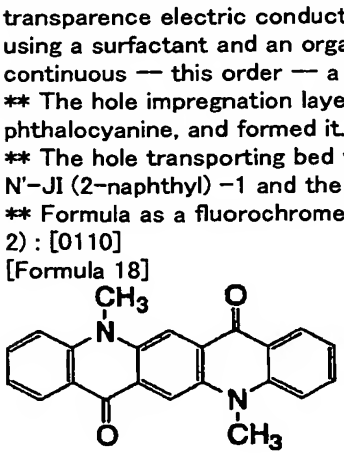
[0008] Moreover, when external [of the external filters produced beforehand, such as the shape of the above-mentioned external filter, especially a film,] is carried out to the component which gave flexibility, for example using the plastic film flexible as a transparence substrate etc., there is a possibility of producing the problem of checking the flexibility as the whole component, or exfoliating when it sags a component in itself, even if the external filter concerned is excellent in flexibility.

[0009] The object of this invention is to offer the new transparence electric conduction substrate which can give the function of a filter to components, such as an organic electroluminescent element, and the organic electroluminescent element using it, without using a filter for post-installation with a possibility of producing the above various problems.

[Translation done.]

EXAMPLE

[Example] This invention is explained based on an example and the example of a comparison below.
<Transparence electric conduction substrate> Using example 1 surfactant and the organic solvent, one by one, it set with the mask which has a predetermined pattern in the vacuum evaporator equipped with the electron beam evaporation source (2kW) which is an evaporation source of ITO as a transparence electrical conducting material about the glass substrate cleaned ultrasonically, and the resistance heating type evaporation source using a quartz cell which is an evaporation source of the copper phthalocyanine as coloring matter, and the inside of equipment was decompressed and exhausted to degree of vacuum 5x10-6torr.
[0103] And heating a glass substrate at 200 degrees C, ITO and a copper phthalocyanine were evaporated from both the above-mentioned evaporation sources, on the glass substrate, pattern formation of the transparence electric conduction film corresponding to the pattern of the above-mentioned mask was carried out by simultaneous vacuum evaporationo, and the transparence electric conduction substrate was manufactured.
[0104] At this time, the evaporation rate of ITO set 3A/[a second and] and vacuum evaporationo time amount as for 2 minutes for the evaporation rate of 12A /and a copper phthalocyanine a second.
[0105] The obtained transparence electric conduction film presented blue, and, for the thickness, 1800A and the content rate of a copper phthalocyanine was [the resistivity of the permeability of light with a 20 volume % and a wavelength of 550nm] 5.2x10-4ohm and cm 64.8%.
[0106] Except having carried out the evaporation rate of the copper phthalocyanine as quality of 2 suits of examples variety entertainments in 5A/second, like the example 1, pattern formation of the transparence electric conduction film was carried out on the glass substrate, and the transparence electric conduction substrate was manufactured.
[0107] The obtained transparence electric conduction film presented blue deeper than an example 1, and, for the thickness, 2040A and the content rate of a copper phthalocyanine was [the resistivity of the permeability of light with a 29.4 volume % and a wavelength of 550nm] 8.2x10-4 ohm-cm 55.4%.
[0108] Except having replaced with the copper phthalocyanine and having used 2 and 3-Quinacridone as quality of 3 suits of examples variety entertainments, like the example 1, pattern formation of the transparence electric conduction film was carried out on the glass substrate, and the transparence electric conduction substrate was manufactured.
[0109] The obtained transparence electric conduction film presented green, and, for the thickness, the content rate of 1800A, 2, and 3-Quinacridone was [the resistivity of the permeability of light with a 20 volume % and a wavelength of 550nm] 6.5x10-4 ohm-cm 67.2%.
<an organic electroluminescent element> — the transparence electric conduction film [which was colored] top which sets in a vacuum evaporator and serves as the filter of the transparence electric conduction substrate concerned under the condition of a degree of vacuum 10-6 - 10-7torr after cleaning ultrasonically first the transparence electric conduction substrate manufactured in the example 4 above-mentioned example 1 one by one using a surfactant and an organic solvent — following each class — respectively — a vacuum deposition method — continuous — this order — a laminating — it formed.
** The hole impregnation layer with a thickness of 400A which carried out vacuum deposition of the copper phthalocyanine, and formed it.
** The hole transporting bed with a thickness of 400A which carried out vacuum deposition of N, N'-diphenyl-N, and N'-JI (2-naphthyl) -1 and the 1'-biphenyl-4,4'-diamine, and formed them.
** Formula as a fluorochrome belonging to the Quinacridone derivative expressed with said general formula (3) (3-2) : [0110]
[Formula 18]



(3-2)

[0111] An electronic transporting bed-cum-the luminous layer with a thickness of 600A which was formed by coming out and carrying out the simultaneous vacuum evaporationo of N expressed, the N'-dimethyl -2, 3-

Quinacridone, and the tris (8-quinolate) aluminum (III) complex and which contains Above N, the N'-dimethyl -2, and 3-Quinacridone at a rate of 0.4 volume %.
** The inorganic electronic injection layer with a thickness of 10A formed by carrying out vacuum deposition of the lithium fluoride (LiF).
** The cathode body with a thickness of 1000A formed by carrying out vacuum deposition of the aluminum.
[0112] Next, the transparence electric conduction substrate which the above-mentioned process ended was put in all over the glove compartment, and the glass plate for closure with which above-mentioned each class of the transparence electric conduction substrate concerned applied the epoxy resin of ultraviolet-rays hardenability to the laminating and the formed field with the desiccating agent (barium oxide) under desiccation nitrogen-gas-atmosphere mind was stuck, it closed by stiffening an epoxy resin according to UV irradiation and heat curing, and the organic electroluminescent element was manufactured.
[0113] When the contrast of a part for a light-emitting part and a nonluminescent part divided by carrying out pattern formation of the transparence electric conduction film as mentioned above was measured under conditions with an illuminance of 50 luxs, making the obtained organic electroluminescent element emit light with the brightness of 300 cd/cm2, the high value 80:1 was shown. Moreover, when luminescence was observed actually, the luminescence pattern for a light-emitting part was fully able to be checked also under the above-mentioned conditions.
[0114] As an example of comparison 1 transparence electric conduction substrate, the charge of a coloring matter was not contained but the organic electroluminescent element was manufactured like the example 4 except having used what has the transparence electric conduction film with a thickness of 1800A by which pattern formation was carried out only in ITO.
[0115] Making the obtained organic electroluminescent element emit light with the brightness of 300 cd/cm2, under conditions with an illuminance of 50 luxs, when the contrast of a part for a light-emitting part and a nonluminescent part was measured similarly, the low value 30:1 was shown. Moreover, when luminescence was observed actually, the luminescence pattern for a light-emitting part was not fully able to be checked.

[Translation done.]